

Remarks/Arguments:

Claims 1-19 are pending in the application. Applicants hereby affirm that claims 16-18 have been elected for prosecution and that claims 1-15 and 19 are withdrawn without traverse. The specification has been corrected at paragraphs [070], [090] and [0105] of the application as filed, to correct typographical errors. Claim 16 is amended to incorporate the features of dependent claim 18, which is canceled herewith. New claim 20 is added, as supported in paragraph [052] of the application. New claim 21 is supported in paragraph [0114]. No new matter has been added.

Claims 16-18 are rejected under 35 USC § 102(b) as anticipated by Haggenmueller et al., Aligned single-wall carbon nanotubes in composites by melt processing methods ("Haggenmueller"). The rejection asserts that Haggenmueller's melt-spinning technique inherently produces a continuous thin ribbon having nanotubes that are mechanically aligned in a principal direction to a standard deviation from the principal direction of less than $\pm 15^\circ$. Applicants respectfully disagree that Haggenmueller produces a ribbon containing such oriented nanotubes. Rather, Haggenmueller produces 1) undrawn films containing nanotubes and 2) drawn fibers containing nanotubes. See the Abstract, and page 220, 2nd column, 1st and 2nd full paragraphs. The fibers are drawn through a single spinneret hole having a diameter of 600 μm and wound up on a spool. Since the term "diameter" is used, it is apparent that the drawn fiber is essentially circular in cross-section, not a ribbon. The films are made either by solvent-casting a polymer/nanotube mixture in a Teflon® (polytetrafluoroethylene) dish ("Method 1") or by stacking and hot-pressing pieces of the material made by Method 1 to make thin films ("Method 2"). Neither the Method 1 film nor the Method 2 film is continuous, as recited in the claims, and in neither case is the film drawn or otherwise manipulated in a manner that is indicated to produce nanotubes that are mechanically aligned in a principal direction to a standard deviation from the principal direction of less than $\pm 15^\circ$, also as recited in the claims.

The "continuous ribbon" and "less than $\pm 15^\circ$ " features are alleged to be inherently disclosed. But, "In relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art."¹ As

¹ *Ex parte Levy*, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990) (emphasis in original). See MPEP 2112 IV.

explained above, a product having both of these features does not necessarily flow from using Haggenmueller's methods. In fact, there is no indication that such a product ever results at all. Thus, Haggenmueller does not anticipate claim 16, and Applicants respectfully request that the rejection be withdrawn. With particular respect to new claim 20, Haggenmueller does not teach a nanocomposite comprising polystyrene. For this additional reason, claim 20 is not anticipated. With respect to new claim 21, Haggenmueller's fibers have diameters² between ~75µm and 10µm rather than a thickness in a range from 80µm to 120µm as recited.

Applicants wish to emphasize that the continuous ribbon form of the claimed nanocomposite is of significant advantage in producing practical, macro-scale devices. The relatively wide, flat shape of the ribbons and their continuous nature make them well suited to tape-placement techniques for forming large pieces. Example 3 describes one such ribbon, prepared by melt-drawing a polymer/nanotube blend extruded through a rectangular die with a width of 13mm and a thickness of 0.35mm, an aspect ratio of 37. The thickness was in a range from 80µm to 120µm. In contrast, Haggenmueller produces simple round fibers having diameters of only between ~75µm and 10µm.

As noted in the application,³ methods for fabricating carbon nanotube composite ribbons according to the invention are readily scalable and can be applied to the fabrication of larger-scale structural/functional materials and devices. Based upon orientation of the nanotubes, the materials can be tailored for specific properties and may have uses in structural, electrical (e.g. EMI shielding, electronics) and thermal (e.g. heat dissipation) applications for multi-functional materials and devices based upon carbon nanotubes. The ribbons may be laminated using traditional composite processing methods, such as autoclave molding or tape placement, to create macro-scale aligned nanocomposites.⁴ Haggenmueller provides only round fibers, and not ribbons particularly adapted to these processing methods. Thus, the claimed composite ribbons represent an advance in the art relative to Haggenmueller.

For the foregoing reasons, Applicants request reconsideration and allowance of the claims. Applicants invite the Examiner to contact their representative, Frank Tise, if it appears that this may expedite examination.

² Haggenmueller, page 222, 2nd column, first paragraph

³ Application as filed, paragraph [050]

⁴ Application as filed, paragraph [054]

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Respectfully submitted,



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